Case Reports

Mycotic Aneurysms of the Ascending Aorta

in the Absence of Endocarditis

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Mycotic aneurysm formation is a rare and potentially fatal sequela of bacteremia. We present the cases of 2 octogenarians who had surgically confirmed mycotic aneurysms that involved the ascending aorta, with contained rupture (pseudoaneurysm). Neither patient had evidence of valvular endocarditis. Patient 1, an 82-year-old man, had streptococcal bacteremia. Imaging confirmed a mycotic aneurysm of the ascending aorta, and resection was successful. Patient 2, an 83-year-old woman, had recurrent staphylococcal bacteremia and progressive widening of the mediastinum, and imaging revealed a mycotic pseudoaneurysm. She underwent surgical repair with use of a bovine pericardial patch, but she died 2 weeks later because of patch dehiscence.

We did not initially suspect mycotic aneurysm in either patient. Despite the availability of accurate, noninvasive imaging techniques, strong clinical suspicion is required for the early diagnosis of mycotic aneurysm. ***(Tex Heart Inst J 2012;39(5):692-5)***

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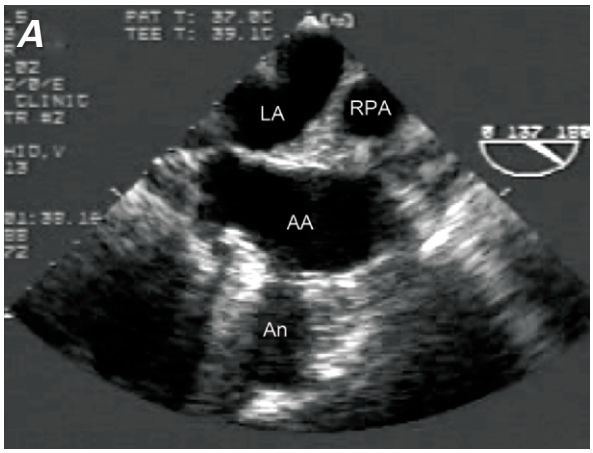
Infection of the aortic wall that results in mycotic aneurysm formation, a potentially fatal sequela of bacteremia, is very rare. In a series of 2,585 patients who were treated for aortic aneurysm, only 22 aneurysms (0.9%) were designated as mycotic.[1] The condition is chiefly seen in elderly patients. It also occurs in people who are undergoing hemodialysis, those who are immunosuppressed, and drug addicts, all of whom are susceptible to vascular bacteremic insult.[2] Hematogenous bacterial seeding of the intima or septic embolization to the vasa vasorum from a distant focus often occurs insidiously.[2] The weakening or destruction of one or more layers of the vessel wall by the infectious process and exposure to intra-arterial pressure causes localized, irreversible arterial dilation (aneurysm formation), which can lead to bleeding and a contained rupture (pseudoaneurysm formation). We present the cases of 2 patients who had mycotic aneurysms without endocarditis, and we review the relevant medical literature.

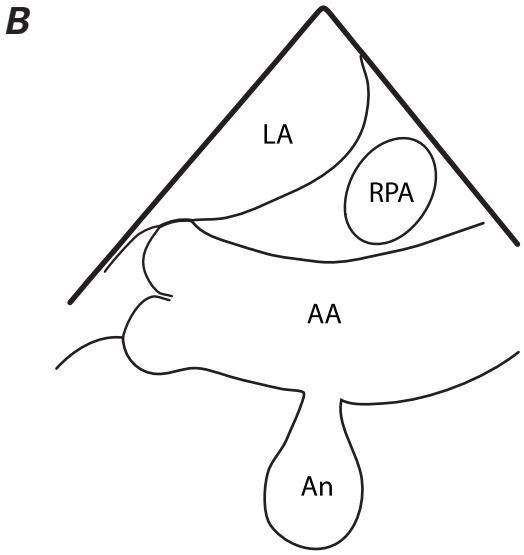
Case Reports

Patient 1

An 82-year-old man presented with a 2-month history of malaise, poor appetite, weight loss, general weakness, failure to thrive, recurrent fever and chills, and night sweats of 1 week's duration. His medical history included transitional-cell carcinoma that had been treated with chemotherapy and adjunctive bacillus Calmette-Guérin a year before the current presentation. He had also undergone coronary artery bypass grafting (18 years before) and carotid endarterectomy, and he had received anticoagulative therapy for chronic atrial fibrillation. On presentation, his temperature was 103 °F; he was hemodynamically stable and reported no chest symptoms. The international normalized ratio was in the supratherapeutic range, at 8.7. A chest radiograph showed a large, right-side pleural effusion. He was admitted to the hospital.

Serial imaging during the next 24 hours included computed tomography, transesophageal echocardiography (TEE) (Fig. 1), and aortography (Fig. 2). A 4-cm aneurysm with a narrow neck was seen to arise from the anterior aspect of the ascending aorta. The aneurysm was above and to the right of the right coronary artery, below the site of the old vein graft, and it was not related to the anastomotic site. No valvular vegetations were identified. A mycotic aneurysm was suspected, and the patient underwent surgery on the 3rd hospital day. Findings included a large inflammatory mass abutting the sternum, consisting of a small saccular aneurysm that had ruptured into a larger pseudoaneurysmal sac. Organizing and nonclotting blood in-





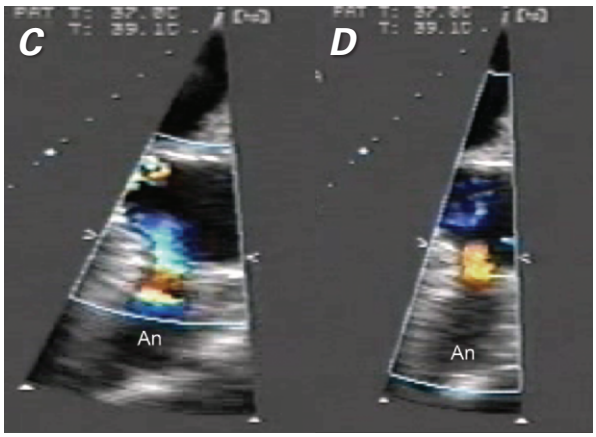


Fig. 1 *Patient 1.* ***A****) Transesophageal echocardiogram (TEE) shows an aneurysm communicating with the anterior aspect of the ascending aorta via a narrow neck.* ***B****) Schematic diagram of the TEE.* ***C****) Color-flow Doppler TEE image during systole shows the flow between the ascending aorta and aneurysm.* ***D****) Color-flow Doppler TEE image during diastole shows the flow from the aneurysm to the ascending aorta.*

AA = ascending aorta; An = aneurysm; LA = left atrium; RPA = right pulmonary artery

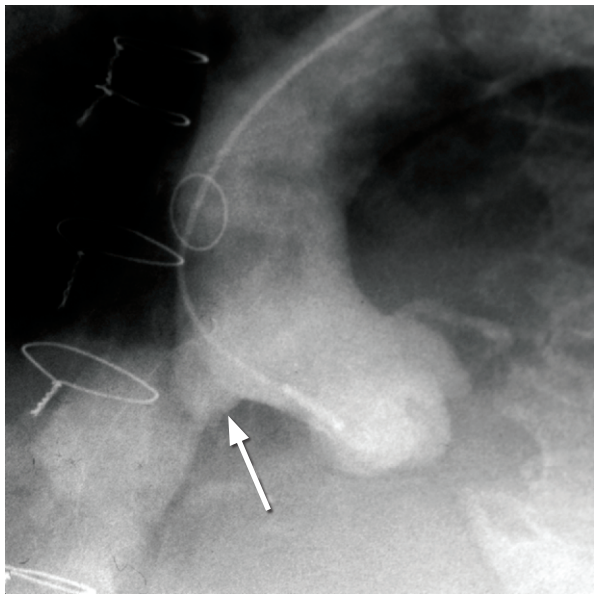


Fig. 2 *Patient 1. Aortogram of the ascending aorta shows the neck of the aneurysm (arrow).*

dicated that the bleeding into the pseudoaneurysm had extended into the right pleural space. Numerous adhesions suggested a chronic process, as did the calcified aortic wall at the base of the aneurysm. The aneurysm was excised, and the aorta was repaired with a bovine pericardial patch. Alpha-hemolytic *Streptococcus viridans* was identified in the blood and urine cultures obtained on admission, and in the surgical specimen. On postoperative day 1, blood cultures and the excised specimen grew gram-positive cocci. The patient was discharged from the hospital on a 5-week course of intravenous penicillin, vancomycin, and gentamicin. Four months later, CT revealed no evidence of an aneurysm or pseudoaneurysm. The patient did well clinically and died of an unrelated cause 4 years later.

Patient 2

An 83-year-old woman with a remote history of smoking and no known history of coronary artery disease or other comorbidities was admitted with a urinary tract infection. A central line was peripherally inserted for intravenous antibiotic administration. She was persistently febrile, and repeat blood cultures grew methicillin-resistant *Staphylococcus aureus* (MRSA). The fever rapidly resolved after vancomycin therapy. However, the fever and MRSA bacteremia recurred after a 2-week course of therapy in the hospital's transitional care unit. The recurrence was thought to be related, in part, to subtherapeutic vancomycin levels. No valvular vegetations were apparent on TEE. Whereas a chest radiograph upon the patient's admission had a normal appearance (Fig. 3A), a radiograph on day 14 showed widening of the mediastinum (Fig. 3B). Repeat TEE revealed a new mediastinal mass adjacent to the ascending aorta.

A chest magnetic resonance image showed a 6-cm pseudoaneurysm of the ascending aorta at the origin of the brachiocephalic artery (Fig. 4). Emergent coronary angiography revealed new, incidental left anterior descending coronary artery stenosis, and left ventriculography showed normal left ventricular systolic function. Intraoperatively, a thin-walled aneurysm, with an overlying hematoma affecting the distal ascending aorta, was seen to originate at the right lateral side of the ostium of the brachiocephalic artery. Calcific deposits on the affected aortic wall were excised, leaving a gap that precluded primary closure. The small gap was covered with a bovine pericardial patch graft, affixed with a continuous 3-0 Prolene suture. Aortocoronary bypass grafting with saphenous vein to the left anterior descending

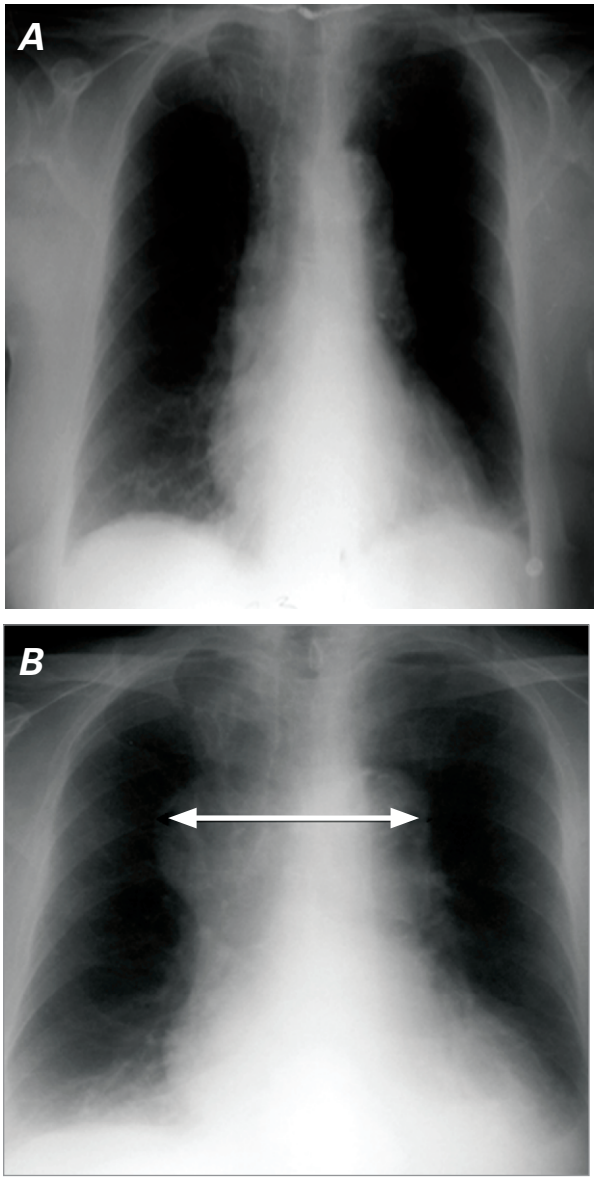


Fig. 3 *Patient 2. Chest radiographs show* ***A****) a normal appearance on admission and* ***B****) a significantly widened mediastinum (arrow).*

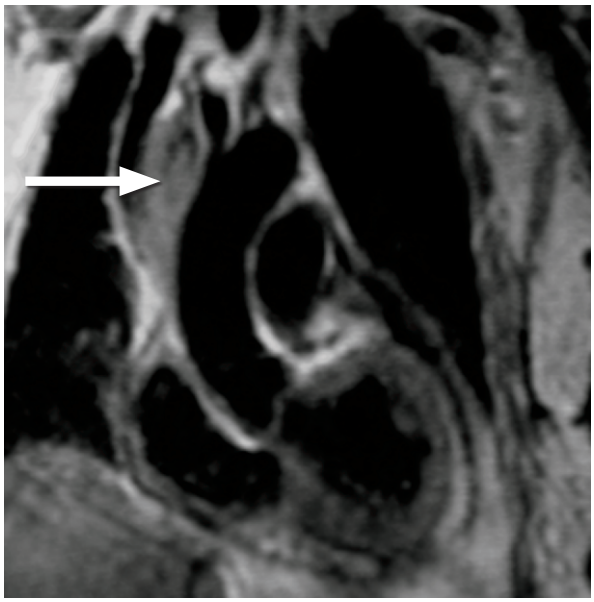


Fig. 4 *Patient 2. Chest magnetic resonance image shows a pseudoaneurysm of the ascending aorta (arrow).*

coronary artery was performed. Separate fluid cultures from the aneurysm, hematoma, and pericardial sac all grew MRSA. Results of microscopic histopathology revealed an organizing thrombus outside the aortic wall, and MRSA grew in subsequent cultures from the surgical specimen. The patient made a good initial recovery and was extubated on postoperative day 3. She received preoperative, intraoperative, and postoperative intravenous vancomycin therapy (500 mg every 12 hr) with a goal of a 6- to 8-week course after repair. She was transferred to an inpatient rehabilitation unit, where after 2 weeks she had a sudden cardiac arrest with electromechanical dissociation. Despite urgent surgery, she died of bovine patch dehiscence.

Discussion

Although the original term for this aneurysm, introduced by Osler, was intended to highlight the resemblance to fungal vegetations,[3] most mycotic aneurysms in the contemporary era are caused by bacterial infections. The pathogens most commonly implicated in mycotic aneurysms are, in order of decreasing frequency, *S. aureus*, *S. epidermidis*, salmonella, and streptococcus.[1] Bacterial valvular endocarditis, once a predominant cause of mycotic aneurysms, now accounts for only a minority of cases.[4-6] Neither of our patients had evidence of valvular vegetation to suggest endocarditis.

Bleeding related to erosion of the vessel wall typically occurs during the bacteremic phase, as in our patients. However, because progressive enlargement related to weakening of the aortic wall can develop after the infection is cleared, the risk of rupture persists, and rup-

ture can occur months or years after the index episode of bacteremia.[7,8] Mycotic aneurysms can form anywhere in the body, including the systemic or cerebral circulation. Involvement has been reported in the abdominal aorta, other segments of the thoracic aorta, and the iliac, femoral, mesenteric, carotid, cerebral, and brachial arteries.[9] An aortic aneurysm can develop relatively rapidly during hospitalization, as in our Patient 2, which highlights the value of serial imaging studies when the condition is clinically suspected.

The initial clinical features of mycotic aneurysms, such as systemic sepsis or fever of unknown origin, can be misattributed to the original source of infection. In both of our patients, and in many previously reported cases, mycotic aneurysm was not suspected initially—the diagnosis was eventually made during searches for the source of persistent fever or sepsis. Therefore, despite the availability of noninvasive imaging techniques, strong clinical suspicion remains indispensable for early diagnosis.[2] Prompt, definitive treatment is crucial, because rupture of the aneurysm can be fatal.[10]

As in our patients, chest radiography, CT, magnetic resonance imaging, TEE, and aortography can be used to diagnose mycotic aneurysms.[11,12] A negative or equivocal result after the use of one method should prompt additional imaging with another method. The curative treatment of mycotic aneurysms depends upon strong clinical suspicion, early definitive diagnosis, appropriate antibiotic therapy, and complete excision of the affected aortic region as soon as possible.

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